PROBLEMAS DE FLUIDOS

(11) $m_2 = 5000\ kg$

$A_2 = 30\ m^2$

¿ m_1 ?

$r_1 = 0'5\ m$

$A_1 = \pi \cdot r_1^2 = \pi \cdot 0'5^2 = 0'785\ m^2$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2} \Rightarrow \frac{m_1 \cdot g}{A_1} = \frac{m_2 \cdot g}{A_2} \Rightarrow$$

$$\Rightarrow m_1 = m_2 \cdot \frac{A_1}{A_2} = 5000 \cdot \frac{0'785}{30} = \boxed{131\ kg}$$

(12) $r_1 = 0'03\ m$

$r_2 = 0'6\ m$

¿ F_1 ?

$m_2 = 2000\ kg$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2} \Rightarrow F_1 = F_2 \cdot \frac{A_1}{A_2} =$$

$$= m_2 \cdot g \cdot \frac{\pi \cdot r_1^2}{\pi \cdot r_2^2} = m_2 \cdot g \cdot \left(\frac{r_1}{r_2}\right)^2 =$$

$$= 2000 \cdot 10 \cdot \left(\frac{0'03}{0'6}\right)^2 = \boxed{50\ N}$$

(13) $m = 30\ kg$

$d = 6\ \frac{g}{cm^3}$

¿E, P_{ap}?

$$V = \frac{m}{d} = \frac{30\ \cancel{kg}}{6000\ \frac{\cancel{kg}}{m^3}} = 5 \cdot 10^{-3}\ m^3$$

$$E = d_F \cdot V_s \cdot g = 1000 \cdot 5 \cdot 10^{-3} \cdot 10 = \boxed{50\ N}$$

$$P = m \cdot g = 30 \cdot 10 = 300\ N$$

$$P_{ap} = P - E = 300 - 50 = \boxed{250\ N}$$

(14) $V = 200\ cm^3$

$m = 300\ g$

$m_{ap} = 140\ g$

¿d_L, d_s?

$$d_s = \frac{m_s}{V_s} = \frac{300\ g}{200\ cm^3} = \boxed{1'5\ \frac{g}{cm^3}}$$

$$P_{ap} = m_{ap} \cdot g = 0'14 \cdot 10 = 1'4\ N$$

$$P = m \cdot g = 0'3 \cdot 10 = 3\ N$$

$$P_{ap} = P - E \Rightarrow E = P - P_{ap} = 3 - 1'4 = 1'6\ N$$

$$E = d_L \cdot V_s \cdot g \Rightarrow d_L = \frac{E}{V_s \cdot g} = \frac{1'6}{200 \cdot 10^{-6} \cdot 10} =$$

$$= 800\ \frac{kg}{m^3} = \boxed{0'8\ \frac{g}{cm^3}}$$

(15) $m = 100\ kg$

$V = 80\ dm^3 = 80\ l$

¿ E, P_{ap} ?

$d = \frac{m}{V} = \frac{100.000\ g}{80.000\ cm^3} = 1'25\ \frac{g}{cm^3} > 1\ \frac{g}{cm^3}$

Se hundirá

$E = d_F \cdot V_s \cdot g = 1000 \cdot 80 \cdot 10^{-3} \cdot 10 = \boxed{800\ N}$

$P = m \cdot g = 100 \cdot 10 = 1000\ N$

$P_{ap} = P - E = 1000 - 800 = \boxed{200\ N}$

(16) $a = 0'6\ m$

$b = 0'4\ m$

$c = 0'15\ m$

$h = 0'08\ m$

¿ d_s, E, P_{ap} ?

$V_{sólido} = a \cdot b \cdot c = 0'6 \cdot 0'4 \cdot 0'15 = 0'036\ m^3$

$V_{sumergido} = a \cdot b \cdot h = 0'6 \cdot 0'4 \cdot 0'08 = 0'0192\ m^3$

$E = P \Rightarrow d_F \cdot V_s \cdot g = m \cdot g \Rightarrow$

$\Rightarrow m = d_F \cdot V_s = 1000 \cdot 0'0192 = 19'2\ kg$

$d_s = \frac{m_{sólido}}{V_{sólido}} = \frac{19'2}{0'036} = 533\ \frac{kg}{m^3} = \boxed{0'533\ \frac{g}{cm^3}}$

$E = d_F \cdot V_s \cdot g = 1000 \cdot 0'0192 \cdot 10 = \boxed{192\ N}$

$P_{ap} = P - E = 192 - 192 = \boxed{0\ N}$

(17) $r = 1'5$ cm

$d_s = 8'96 \frac{g}{cm^3}$

$P_{ap} = 1'14$ N

¿ d_L, E, P_{ap}?

$V = \frac{4}{3} \cdot \pi \cdot r^3 = \frac{4}{3} \cdot \pi \cdot 0'015^3 = 1'41 \cdot 10^{-5} m^3$

$m_s = d_s \cdot V_s = 8960 \frac{kg}{m^3} \cdot 1'41 \cdot 10^{-5} m^3 =$

$= 0'126$ kg

$P = m \cdot g = 0'126 \cdot 10 = 1'26$ N

$\boxed{P_{ap} = 1'14 \text{ N}}$

$P_{ap} = P - E \Rightarrow E = P - P_{ap} = 1'26 - 1'14 = \boxed{0'12 \text{ N}}$

$E = d_L \cdot V_s \cdot g \Rightarrow d_L = \frac{E}{V_s \cdot g} = \frac{0'12}{1'41 \cdot 10^{-5} \cdot 10} =$

$= 851 \frac{kg}{m^3} = \boxed{0'851 \frac{g}{cm^3}}$

(18) $h = 0'05$ m

$D = 0'02$ m

$m = 47'1$ g

a) ¿ d_s?

b) ¿ P_{ap}?

a) $V = \pi \cdot r^2 \cdot h = \pi \cdot 0'01^2 \cdot 0'05 = 1'57 \cdot 10^{-5} m^3$

$d_s = \frac{m_s}{V_s} = \frac{47'1 \cdot 10^{-3} kg}{1'57 \cdot 10^{-5} m^3} = 3000 \frac{kg}{m^3} =$

$= \boxed{3 \frac{g}{cm^3}}$

b) $P = m \cdot g = 0'0471 \cdot 10 = 0'471$ N

$E = d_p \cdot V_s \cdot g = 1000 \cdot 1'57 \cdot 10^{-5} \cdot 10 = 0'157$ N

$P_{ap} = P - E = 0'471 - 0'157 = \boxed{0'314 \text{ N}}$

(19) $m = 307\ g$

$\ell = 8\ cm$

a) ¿d_s?

b) ¿h?

c) ¿E?

d) ¿P_{ap}?

a) $d_s = \frac{m_s}{V_s}$; $V_{sólido} = \ell^3 = 8^3 = 512\ cm^3$

$d_s = \frac{m_s}{V_s} = \frac{307\ g}{512\ cm^3} = \boxed{0'6\ \frac{g}{cm^3}}$

b) $E = P \Rightarrow d_F \cdot V_s \cdot g = m \cdot g \Rightarrow$

$\Rightarrow d_F \cdot \ell^2 \cdot h = m \Rightarrow$

$\Rightarrow h = \frac{m}{d_F \cdot \ell^2} = \frac{0'307}{1000 \cdot 0'08^2} = 0'048\ m = \boxed{4'8\ cm}$

c) $E = d_F \cdot V_s \cdot g = 1000 \cdot 0'08^2 \cdot 0'048 \cdot 10 = \boxed{3'07\ N}$

d) $\boxed{P_{ap} = 0}$ Porque está flotando.

(20) $a = 0'7\ m$

$b = 0'4\ m$

$c = 0'3\ m$

$d = 0'5\ \frac{g}{cm^3}$

¿h?

$V_s = a \cdot b \cdot h = 0'7 \cdot 0'4 \cdot h = 0'28 \cdot h$

$E = P \Rightarrow d_F \cdot V_s \cdot g = m \cdot g$

$V_{sólido} = a \cdot b \cdot c = 0'7 \cdot 0'4 \cdot 0'3 = 0'084\ m^3$

$m = d \cdot V = 500\ \frac{kg}{m^3} \cdot 0'084\ m^3 = 42\ kg$

$d_F \cdot V_s = m \Rightarrow d_F \cdot 0'28 \cdot h = 42 \Rightarrow$

$\Rightarrow h = \frac{42}{0'28 \cdot d_F} = \frac{150}{d_F}$

a) $h = \frac{150}{1000} = \boxed{0'15\ m}$ b) $h = \frac{150}{800} = \boxed{0'187\ m}$

c) $h = \frac{150}{13600} = \boxed{0'011\ m}$ d) $h = \frac{150}{1100} = \boxed{0'136\ m}$

e) $h = \frac{150}{935'2} = \boxed{0'16\ m}$ (5)

(21) $P = 0'32\ N$

$P_{ap} = 0'20\ N$

¿V? → cm^3

¿d_s?

$P = m_s \cdot g \Rightarrow m_s = \frac{P}{g} = \frac{0'32}{10} = 0'032\ kg$

$P_{ap} = P - E \Rightarrow E = P - P_{ap} =$

$= 0'32 - 0'20 = 0'12\ N$

$E = d_F \cdot V_s \cdot g \Rightarrow V_s = \frac{E}{d_F \cdot g} = \frac{0'12}{1000 \cdot 10} = 1'2 \cdot 10^{-5}\ m^3 =$

$= \boxed{12\ cm^3}$

$d_s = \frac{m_s}{V_s} = \frac{32\ g}{12\ cm^3} = \boxed{2'67\ \frac{g}{cm^3}}$

(22) $m = 0'5\ kg$

$P_{ap} = 3\ N$

¿V_s, d_s?

$P = m \cdot g = 0'5 \cdot 10 = 5\ N$

$P_{ap} = P - E \Rightarrow E = P - P_{ap} =$

$= 5 - 3 = 2\ N$

$E = d_F \cdot V_s \cdot g \Rightarrow V_s = \frac{E}{d_F \cdot g} = \frac{2}{1000 \cdot 10} = 2 \cdot 10^{-4}\ m^3 =$

$= \boxed{200\ cm^3}$

$d_s = \frac{m_s}{V_s} = \frac{500\ g}{200\ cm^3} = \boxed{2'5\ \frac{g}{cm^3}}$

(23) $d = 2700 \frac{kg}{m^3}$

$V = 2\ dm^3$

$P_{ap} = 12\ N$

¿d_L?

$d_s = \frac{m}{V} \Rightarrow m = d_s \cdot V_s =$

$= 2700 \frac{kg}{m^3} \cdot 2 \cdot 10^{-3}\ m^3 = 54\ kg$

$P = m \cdot g = 54 \cdot 10 = 54\ N$

$P_{ap} = P - E \Rightarrow E = P - P_{ap} =$

$= 54 - 12 = 42\ N$

$E = d_L \cdot V_s \cdot g \Rightarrow d_L = \frac{E}{V_s \cdot g} = \frac{42}{2 \cdot 10^{-3} \cdot 10} = 2100 \frac{kg}{m^3} =$

$= \boxed{2'1 \frac{g}{cm^3}}$

(24) $m = 4'9\ g$

$P_{ap} = 0'0441\ N$

$d_s = 19'3 \frac{g}{cm^3}$

$P_{ap} = P - E$

$P = m \cdot g = 4'9 \cdot 10^{-3} \cdot 10 = 0'049\ N$

$E = P - P_{ap} = 0'049 - 0'0441 = 4'9 \cdot 10^{-3}\ N$

$E = d_L \cdot V_s \cdot g \Rightarrow V_s = \frac{E}{d_L \cdot g} = \frac{4'9 \cdot 10^{-3}}{1000 \cdot 10} = 4'9 \cdot 10^{-7}\ m^3 =$

$= 0'49\ cm^3$

$m = d_s \cdot V_s = 19'3 \frac{g}{cm^3} \cdot 0'49\ cm^3 = 9'46\ g \neq 4'9\ g \Rightarrow$

$\Rightarrow$ **No es oro puro**

(25) $V = 10\ cm^3$

$P_{ap} = 0'72\ N$

$P_{ap} = 0'60\ N$

¿ d_L?

$P_{ap} = P - E \Rightarrow E = P_{ap} - P_{ap} =$

$= 0'72 - 0'60 = 0'12\ N$

$E = d_L \cdot V_s \cdot g$

$$d_L = \frac{E}{V_s \cdot g} = \frac{0'12}{10 \cdot 10^{-6} \cdot 10} = 1200\ \frac{kg}{m^3} = \boxed{1'2\ \frac{g}{cm^3}}$$

(26) $m = 350\ g$

$d_s = 2'8\ \frac{g}{cm^3}$

$d_{aire} = 1'2\ \frac{g}{l}$

a) ¿ V_s?

b) ¿ E_{aire}?

c) ¿ E_{agua}?

d) ¿ N?

a) $V_s = \frac{m_s}{d_s} = \frac{350}{2'8} = \boxed{125\ cm^3}$

b) $E_{aire} = d_{aire} \cdot V_s \cdot g =$

$= 1'2 \cdot 125 \cdot 10^{-6} \cdot 10 = \boxed{1'5 \cdot 10^{-3}\ N}$

c) $E_{agua} = d_{agua} \cdot V_s \cdot g =$

$= 1000 \cdot 125 \cdot 10^{-6} \cdot 10 = \boxed{1'25\ N}$

d) $N = \frac{E_{agua}}{E_{aire}} = \frac{1'25}{1'5 \cdot 10^{-3}} = \boxed{833\ veces}$

(27) $D = 0'03\ m$

$d_{aire} = 1'2\ \frac{g}{\ell}$

a) ¿V?

b) ¿m?

c) ¿E?

d) ¿P_{ap}?

a) $V = \frac{4}{3}\cdot\pi\cdot r^3 = \frac{4}{3}\cdot\pi\cdot 0'015^3 =$

$= 1'41\cdot 10^{-5}\ m^3 = \boxed{14'1\ cm^3}$

b) $m = d\cdot V = 1'2\ \frac{g}{\ell}\cdot 14'1\cdot 10^{-3}\ \ell =$

$= 0'0169\ g = \boxed{16'9\ mg}$

c) $E = d_F\cdot V_s\cdot g = 1000\cdot 14'1\cdot 10^{-5}\cdot 10 = \boxed{0'141\ N}$

d) $P = m\cdot g = 16'9\cdot 10^{-5}\cdot 10 = 16'9\cdot 10^{-4}\ N$

$P_{ap} = P - E = 16'9\cdot 10^{-4} - 0'141 \simeq \boxed{-0'141\ N}$

(28) $m_1 = 20\ kg$

$m_2 = 5\ kg$

¿E?

¿D?

a) $E = P_T = m_T\cdot g =$

$= (20+5)\cdot 10 = \boxed{250\ N}$

b) $E = d_{aire}\cdot V_s\cdot g$; $P_T = (m_1 + m_2 + m_3)\cdot g$

$E = P_T \Rightarrow d_{aire}\cdot V_s\cdot g = (m_1 + m_2 + d_{He}\cdot V_s)\cdot g \Rightarrow$

$\Rightarrow 1'2\cdot V_s = 25 + 0'178\cdot V_s \Rightarrow (1'2 - 0'178)\cdot V_s = 25 \Rightarrow$

$\Rightarrow V_s = \frac{25}{1'2 - 0'178} = 24'5\ m^3$; $V = \frac{4}{3}\cdot\pi\cdot r^3 \Rightarrow$

$\Rightarrow r = \sqrt[3]{\frac{3\cdot V}{4\cdot\pi}} = \sqrt[3]{\frac{3\cdot 24'5}{4\cdot\pi}} = 1'8\ m \Rightarrow D = 2\cdot r =$

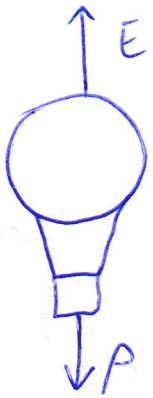
$= 2\cdot 1'8 = \boxed{3'6\ m}$

(29) $m_1 = 200$ kg

$d_{frío} = 1'2 \frac{g}{l}$

$d_{caliente} = 0'8 \frac{g}{l}$

¿V? ¿E? ¿P_{ap}?



$E = P_T$

$d_{frío} \cdot V_s \cdot g = (m_1 + m_2) \cdot g$

$d_{frío} \cdot V_s = m_1 + d_{caliente} \cdot V$

$1'2 \cdot V_s = 200 + 0'8 \cdot V_s \Rightarrow 1'2 \cdot V_s - 0'8 \cdot V_s = 200 \Rightarrow$

$\Rightarrow 0'4 \cdot V_s = 200 \Rightarrow V_s = \frac{200}{0'4} = \boxed{500\ m^3}$

$E = d_{frío} \cdot V_s \cdot g = 1'2 \cdot 500 \cdot 10 = \boxed{6000\ N}$

$P_{ap} = P - E = \boxed{0\ N}$

(30) $m_1 = 5$ ton

$m_2 = 7$ kg

$V = 2\ m^3$

$E = P_T$

$d_{agua} \cdot V_s \cdot g = (m_1 + N \cdot m_2 + N \cdot d_{aire} \cdot V_s) \cdot g$

$1000 \cdot 2 \cdot N = 5000 + N \cdot 7 + N \cdot 1'2 \cdot 2$

$2000 \cdot N = 5000 + 9'4 \cdot N$

$2000 \cdot N - 9'4 \cdot N = 5000 \Rightarrow 1991 \cdot N = 5000 \Rightarrow$

$\Rightarrow N = \frac{5000}{1991} = 2'5 \Rightarrow \boxed{3 \text{ globos}}$

(31) $r = 10\ cm$

$d_{aire} = 1'2\ \frac{g}{\ell}$

a) ¿V?

b) ¿m_T?

$m_1 = 10\ g$

c) ¿P_{ap}?

d) ¿m?

a) $V = \frac{4}{3} \cdot \pi \cdot r^3 = \frac{4}{3} \cdot \pi \cdot 10^3 = 4189\ cm^3 \simeq$

$\simeq \boxed{4190\ cm^3}$

b) $m_T = m_1 + m_2 = m_1 + d \cdot V =$

$= 10 + 1'2\ \frac{g}{\ell} \cdot 4'19\ \ell = \boxed{15\ g}$

c) $P_{ap} = P - E$

$P = m_T \cdot g = 0'015 \cdot 10 = 0'15\ N$

$E = d_{aire} \cdot V_s \cdot g = 1000 \cdot 4190 \cdot 10^{-6} \cdot 10 = 41'9\ N$

$P_{ap} = P - E = 0'15 - 41'9 = \boxed{-41'8\ N}$

d) $P_{ap} = m_{ap} \cdot g \Rightarrow m_{ap} = \frac{P_{ap}}{g} = \frac{41'8}{10} = \boxed{4'18\ kg}$

(32) $D = 0'5\ cm$

$d_{aceite} = 0'8\ \frac{g}{cm^3}$

a) ¿V?

b) ¿m?

c) ¿E?

d) ¿P_{ap}?

a) $r = \frac{D}{2} = \frac{0'5}{2} = 0'25\ cm$

$V = \frac{4}{3} \cdot \pi \cdot r^3 = \frac{4}{3} \cdot \pi \cdot 0'25^3 = \boxed{0'0654\ cm^3}$

b) $m = d_{aceite} \cdot V = 0'8\ \frac{g}{cm^3} \cdot 0'0654\ cm^3 =$

$= \boxed{0'0523\ g}$

c) $E = d_F \cdot V_s \cdot g = 1000 \cdot 0'0654 \cdot 10^{-6} \cdot 10 = \boxed{6'54 \cdot 10^{-4}\ N}$

d) $P = m \cdot g = 0'0523 \cdot 10^{-3} \cdot 10 = 5'23 \cdot 10^{-4}\ N$

$P_{ap} = P - E = 5'23 \cdot 10^{-4} - 6'54 \cdot 10^{-4} = \boxed{-1'31 \cdot 10^{-4}\ N}$